



THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Taison Tan et al.

Serial No.: 10/718,981

Filed: November 20, 2003

For: PRIMERY BATTERY HAVING SLOPED VOLTAGE DECAY

Group No.: 1795

Examiner: Hodge, Robert W.

Docket No. Q175-US1

MS Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANT'S BRIEF

I. REAL PARTY IN INTEREST

The real party in interest is Quallion, LLC the assignee of the above referenced application.

II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences are known which will be affected by this appeal.

III. STATUS OF CLAIMS

The application under appeal includes pending claims 1-3, 5-23, 25-33, 74-75, and 78. Claims 1-3, 5-23, 25-33, 74-75, and 78 were previously presented. Claims 4, 24, and 34-73 are canceled. Claims 76 and 77 are withdrawn.

1. Claims 1-3, 5-18, 74, 75, and 78 stand rejected under 35 USC §112 for failing to comply with the written description requirement.
2. Claims 1-3, 5-10, and 14 stand rejected under 35 USC §103(a) as being unpatentable over U.S. Patent number 5,147,739 (Beard) in view of U.S. Patent publication number 2002/0172862 (Tamura).
3. Claims 11, 74, and 75 stand rejected under 35 USC §103(a) as being unpatentable over Beard in view of Tamura and further in view of U.S. Patent Publication number 2002/0004169 (Yamada).
4. Claims 12, 13, and 15-18 stand rejected under 35 USC §103(a) as being unpatentable over Beard in view of Tamura and further in view of U.S. Patent Publication number 2003/0211383 (Munshi).
5. Claims 19-23, 25, 26, 29, 32, and 33 stand rejected under 35 USC §103(a) as being unpatentable over Beard in view of Yamada.
6. Claims 27, 28, 30, and 31 stand rejected under 35 USC §103(a) as being unpatentable over Beard in view of Yamada and further in view of Munshi.
7. Claims 78 stands rejected under 35 USC §103(a) as being unpatentable over Beard in view of Yamada and further in view of Tamura.

IV. STATUS OF AMENDMENTS

The Applicant submitted an RCE and amendment on December 10, 2008. In Response an Office Action was mailed on January 30, 2009 (the Office Action). An amendment is filed along with this Appeals Brief canceling claims 34-47.

As a result, the pending claims are the claims that were present in the Response December 10, 2008 less claims 34-47.

V. SUMMARY OF CLAIMED SUBJECT MATTER

In accordance with 37 CFR § 41.37c(1)(v), Appellants provide a brief summary of each independent claim involved in the appeal, where each summary refers to the specification by page and line number and to the drawings by reference number. Appellants note that the citations in this "Summary of claimed subject matter" are provided to identify some portions of the specification related to the particular claims. In the interest of brevity, each claim summary does not necessarily include all references to all relevant portions of the specification and drawings. Accordingly, omission of any reference to the specification or to the drawings should not be construed in any way as an intent to relinquish claim scope, or as an implication or statement regarding the conformance with 35 U.S.C. §112. Appellants respectfully submit that the claims should not be construed as being limited to the embodiments cited in the claim summary, and further submit that other embodiments, as well as the Doctrine of Equivalents, may apply in determining claim scope.

Summary of Independent Claim 1

Independent claim 1 is directed to a primary battery. The primary battery includes a cathode (labeled 12 in Figure 1, paragraph [0022]) and an anode (labeled 14 in Figure 1, paragraph [0022]). The anode has a first medium (labeled 20 in Figure 1, paragraph [0022]) including a first active material (paragraph [0027]) and a second medium (labeled 22 in Figure 1, paragraph [0022]) having a concentration gradient (paragraphs [0005], paragraphs [0009], and paragraphs [0042]) of a second active material paragraph [0027]. The battery also has an electrolytic solution in contact with the cathode and the anode (paragraph [0022]).

Summary of Independent Claim 19

Independent claim 19 is directed to a primary battery. The primary battery includes a cathode (labeled 12 in Figure 1, paragraph [0022]) and an anode (labeled 14 in Figure 1, paragraph [0022]). The anode has a first medium (labeled 20 in Figure 1, paragraph [0022]) including first active material (paragraph [0027]) and a second medium including a second active material (labeled 22 in Figure 1, paragraph [0022]). The second medium has a chemical composition that is different from a chemical composition of the first medium and the chemical composition of the first active material having a component in common with a chemical

composition of the second active material (paragraphs [0006] and [0010]). The first active medium contacts the second active medium (paragraph [0024]). The first active medium including lithium metal and the second medium including SiO and the second active material including LiSiO (paragraph [0062]). An electrolytic solution is in contact with the anode and the cathode (paragraph [0005]).

VI. GROUND S OF REJECTION TO BE REVIEWED ON APPEAL

1. Rejection of Claims 1-3, 5-18, 74, 75, and 78 under 35 USC §112 for failing to comply with the written description requirement.
2. Rejection of Claims 1-3, 5-10, and 14 under 35 USC §103(a) as being unpatentable over U.S. Patent number 5,147,739 (Beard) in view of U.S. Patent publication number 2002/0172862 (Tamura).
3. Rejection of Claims 11, 74, and 75 under 35 USC §103(a) as being unpatentable over Beard in view of Tamura and further in view of U.S. Patent Publication number 2002/0004169 (Yamada).
4. Rejection of Claims 12, 13, and 15-18 under 35 USC §103(a) as being unpatentable over Beard in view of Tamura and further in view of U.S. Patent Publication number 2003/0211383 (Munshi).
5. Rejection of Claims 19-23, 25, 26, 29, 32, and 33 under 35 USC §103(a) as being unpatentable over Beard in view of Yamada.
6. Rejection of Claims 27, 28, 30, and 31 under 35 USC §103(a) as being unpatentable over Beard in view of Yamada and further in view of Munshi.
7. Rejection of Claim 78 under 35 USC §103(a) as being unpatentable over Beard in view of Yamada and further in view of Tamura.

VII. ARGUMENT

1. Rejection of Claims 1-3, 5-18, 74, 75, and 78 stand rejected under 35 USC §112 for failing to comply with the written description requirement.

CLAIM 1

Claim 1 stands rejected under 35 USC §112 for failing to comply with the written description requirement. In particular, the Office Action argues that “(t)here is no support in the instant specification for the negative limitation of a “non-zero concentration gradient.”

However, Paragraph [0042] teaches a non-zero concentration gradient when it teaches the following:

Additionally, the second medium can be fabricated such that a gradient of the second active material extends across the width of the second medium. For instance, the concentration of the second active material can decrease in the direction of the arrow labeled G in Figure 1A and in Figure 1B. The result of the gradient is that the concentration of the second active material is larger on the side of the second medium labeled H than at the side of the second medium labeled L.

Additionally, Paragraph 63 teaches a non-zero concentration gradient when it teaches the following:

... converting the second active material precursor to the second active material can include forming a concentration gradient of the second active material in the second medium. For instance, when lithium serves as the first active material precursor and SiO serves as the second active material precursor, the lithium can intercalate into the SiO and convert the SiO to LiSiO as described above. When the lithium and the SiO are contacted as shown in Figure 4, a LiSiO concentration gradient can be formed in the SiO. ... the limits of lithium intercalation distance cause an LiSiO concentration gradient to develop as the thickness of the SiO layer increases. Additionally, the thickness of the SiO layer can be increased until the LiSiO concentration at the side of the SiO opposite the lithium layer is negligible....

Since the specification teaches that the gradient results from intercalation of one material into another and that the intercalation becomes limited with depth, the specification teaches a non-zero concentration gradient as is claimed.

CLAIMS 2-3, 5-18, 74, 75, and 78

The rejection of claims 2-3, 5-18, 74, 75, and 78 under 35USC112 is dependent on the rejection of claim 1 under 35USC112. Since claim 1 satisfies the requirements of 35USC112, claims 2-3, 5-18, 74, 75, and 78 also satisfy the requirements of 35USC112.

2. Rejection of Claims 1-3, 5-10, and 14 under 35 USC §103(a) as being unpatentable over U.S. Patent number 5,147,739 (Beard) in view of U.S. Patent publication number 2002/0172862 (Tamura).

Claims 1-3, 5-10, and 14 stand rejected under 35 USC §103(a) as being unpatentable over U.S. Patent number 5,147,739 (Beard) in view of U.S. Patent publication number 2002/0172862 (Tamura).

CLAIM 1

First Reason that Claim 1 is Patentable over the cited art.

In order for the Examiner “to rely on a reference under 35 USC §103, it must be analogous prior art.” See header of MPEP §2141.01(a). Applicant submits that Tamura is non-analogous art.

The Effect of KSR on the Relevant Law

The previous version of MPEP §2141.01(a) set forth a two-part test for determining whether a piece of prior art is analogous prior art. The test was stated as follows:

First, “the reference must ... be in the field of the applicant’s endeavor.” Second, when the reference is not in Applicant’s field of endeavor, it must “be reasonably pertinent to the particular problem with which the inventor was concerned.”

Further, a “reference is reasonably pertinent if ... it ... logically would have commended itself to an inventor's attention in considering his problem.”

The MPEP cited *Wang Laboratories Inc. v. Toshiba Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993) as support for this test.

MPEP §2141.01(a) has recently been updated to reflect the recent Supreme Court decision in *KSR Int'l v. Teleflex, Inc.* 127 S.Ct. 1727 (2007). While the new MPEP §2141.01(a) does not re-state this test as clearly as it was originally stated, the first paragraph of the new MPEP §2141.01(a) is in agreement with the above two-part test. In fact, the first paragraph of the new MPEP §2141.01(a) uses much of the same language from the above two-part test. In order to further illustrate that the above two part test is good law, the Applicant has included the text of the *Wang Laboratories Inc.* decision in the evidence appendix along with the Westlaw “KEYCITE”® for this case. These results show that the above two-part test remains the proper test for identifying analogous art.

First Part of Non-Analogous Art Test

In order to execute the first part of the non-analogous art test, the field of endeavor for the inventors of the current application must be identified. The Applicant’s field of endeavor is easily identified from the Title of this Application as well as the claims. The Applicant’s field of endeavor is primary batteries. In contrast, Tamura’s title and claims shows that Tamura’s field of endeavor is secondary batteries.

While some aspects of primary batteries and secondary batteries are the same, the chemistries used by these batteries are different. For instance, primary batteries are non-rechargeable while secondary batteries are rechargeable. As a result, secondary batteries make use of reversible reactions at the electrodes while irreversible reactions can occur at the electrodes of primary batteries. Further, these batteries have different electrical characteristics. For instance, primary batteries can be made to have higher energy densities than secondary batteries, while the re-chargeability of secondary batteries generally provides longer lifetimes at lower energy densities.

As a result of the different electrical characteristics, primary batteries are generally used in different applications than secondary batteries. To see how primary and secondary batteries are used in different applications consider that if a primary battery is used for implantable medical devices, surgery is required to replace the battery before the energy is completely drained. However, despite the lower energy density of a secondary battery, it is a desirable

power source for implantable medical devices because they can be recharged from outside of a body without the patient having to undergo a surgical procedure.

In light of the different features of primary and secondary batteries, *Wang Laboratories Inc.* establishes that primary batteries and secondary batteries are not in the same field of endeavor. For instance, the previous version of MPEP §2141.01(a) described the holding in *Wang Laboratories Inc.* as follows:

Reference to a SIMM for an industrial controller **was not necessarily in the same field of endeavor as the claimed subject matter merely because it related to memories.** Reference was found to be in a different field of endeavor because it involved memory circuits in which modules of varying sizes may be added or replaced, whereas the claimed invention involved compact modular memories. Furthermore, since memory modules of the claims at issue were intended for personal computers and used dynamic random-access-memories, whereas reference SIMM was developed for use in large industrial machine controllers and only taught the use of static random-access-memories or read-only-memories, the finding that the reference was non-analogous was supported by substantial evidence. (Emphasis added).

The bolded portion of this quotation establishes that references are not from the same field of endeavor “**merely because (they are) related to memories.**” In the same way, the Applicant and Tamura are not in the same field of endeavor merely because they are related to batteries.

While the bolded portion of the quotations describes what fails to establish that a reference is analogous art, the underlined portion goes further and sets forth what qualifies as evidence of a non-analogous art reference. For instance, the underlined portion of the above quotation establishes that the use of the memories in different applications is evidence that the memories were used in different fields of endeavor. For instance, the fact that one of the memories was used in “**personal computers and dynamic random-access-memories**” but the other memory was used in “**large industrial machine controllers and static random-access-memories or read-only-memories**” was characterized as substantial evidence of the non-analogous nature of the references. Likewise, the use of primary and secondary batteries for different applications is evidence that the Applicant and Tamura are in different fields of endeavor.

Second Part of Non-Analogous Art Test

As noted above, the second part of the two-part test notes that if the reference is not in Applicant's field of endeavor, it must "be reasonably pertinent to the particular problem with which the inventor was concerned." Further, a "reference is reasonably pertinent if ... it ... logically would have commended itself to an inventor's attention in considering his problem." See MPEP §2141.01(a) citing to *Wang Laboratories Inc. v. Toshiba Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993). As a result, the second part of the two-part test requires that we determine the current inventor's problem.

The inventor's problem is set forth in the Background of the specification. For instance, the Background states, "there is a need for batteries that provide a more accurate indication of remaining battery life." As a result, the inventor is trying to find a way to generate primary batteries with improved battery life indications. However, Tamura makes no mention of indications of remaining battery life. As a result, an inventor solving the Applicant's problem would not turn to Tamura for a solution.

Because Tamura is both from a different field of endeavor and is not reasonably pertinent to the Applicant's problem, Tamura fails both parts of the MPEP §2141.01(a) analogous art test. Because Tamura is not analogous prior art, Tamura is not available for use in a rejection under 35 USC §103 and the rejection should be withdrawn. As a result, the holding in *Wang Laboratories* establishes that communications optical chips and devices for substance characterization are not within the same field of endeavor.

Second Reason that Claim 1 is Patentable over the cited art.

The Office Action cites the reasoning in KSR for support of the rejection. However, **a proper obviousness rejection still requires that the cited art teaches or suggests every element of the claims.** This requirement has been set forth in case law with statements such as "obviousness requires a suggestion of all limitations in a claim." *CFMT, Inc. v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003) (citing *In re Royka*, 490 F.2d 981, 985 (CCPA 1974)). There is nothing in the KSR opinion that directly or indirectly overturned the requirement that the cited art teach or suggest every element of a claim properly rejected as obvious. Further, the Board of Patent Appeals and interferences continues to cite and apply this

standard in decisions such as *Ex Parte H. Garrett Wada, and Matthew B. Murphy* (Appeal 2007-1925, decided on June 25, 2007). As a result, current law holds that an obviousness rejection is not properly supported unless the cited art teaches or suggests every element of the claims.

The cited art does not teach or suggest every limitation of the battery recited in claim 1. Claim 1 recites “a non-zero concentration gradient of the second active material in the second medium.” As a result, in order to properly support the rejection, the cited art must teach or suggest a gradient of an **active material in a second medium**. When considered individually, Neither Tamura nor Beard teaches or suggests a gradient of an active material in a second medium. As a result, the Office Action must be relying on the combination of Beard in view of Tamura.

The combination of Beard in view of Tamura also fails to teach or suggest a gradient of an **active material in a second medium**. For instance, Tamura teaches that using a medium having gradient of tin oxide can reduce an undesirable reaction between a tin active material and an electrolyte. Tamura repeatedly teaches that this result is specific to tin active materials. Tamura goes as far as to cite the tin active material in the statement of the invention objective. For instance, Tamura states the following in paragraph 8:

It is **the object of the present invention** to provide an electrode for a lithium secondary battery using a thin film of the **active material containing tin as a main component** and being capable of suppressing the reaction between an electrolyte solution and the active material.

The limitation of Tamura to tin active materials can also be found in the Abstract, Background, and throughout the specification. Beard also does not teach or suggest the use of tin as an active material. Instead, Beard teaches or suggests the use of lithium metal or lithium alloys as the active material. However, Tamura actually teaches that the use of lithium metal is undesirable (paragraph 5) and causes internal shorts. As a result, the only teaching that Tamura provides about the active materials of Beard is that they are undesirable.

Since Tamura’s medium is specifically for use with a tin active material but Beard does not employ a tin active material, the cited art does not teach or suggest using Tamura’s medium in Beard’s device. Accordingly, even when considered in combination, the cited art does not teach every limitation of claim 1 and claim 1 is patentable over the cited art.

CLAIMS 2-3, 5-10, and 14

Since Claims 2-3, 5-10 and 14 each depends from claim 1 and since claim 1 is patentable over the combination of Beard and Tamura for the reasons set forth above, Claims 2-3, 5-10 and 14 are also patentable over the combination of Beard and Tamura.

3. Rejection of Claims 11, 74, and 75 under 35 USC §103(a) as being unpatentable over Beard in view of Tamura and further in view of U.S. Patent Publication number 2002/0004169 (Yamada).

Since Claims 11, 74, and 75 each depends directly or indirectly from claim 1 and since claim 1 is patentable over the cited art, claims 11, 74, and 75 are also patentable over the cited art.

4. Rejection of Claims 12, 13, and 15-18 under 35 USC §103(a) as being unpatentable over Beard in view of Tamura and further in view of U.S. Patent Publication number 2003/0211383 (Munshi).

Since Claims 12, 13, and 15-18 each depends directly or indirectly from claim 1 and since claim 1 is patentable over the cited art, claims 11, 74, and 75 are also patentable over the cited art.

5. Rejection of Claims 19-23, 25, 26, 29, 32, and 33 under 35 USC §103(a) as being unpatentable over Beard in view of U.S. Patent Publication number 2002/0004169 (Yamada).

Claims 19-23, 25, 26, 29, 32, and 33 are rejected under 35 USC §103(a) as being unpatentable over Beard in view of U.S. Patent Publication number 2002/0004169 (Yamada).

CLAIM 19

First Reason that Claim 19 is Patentable over the cited art.

The Office Action argues that it would be obvious to combine the cited art in order to achieve several advantages. In particular, the Office Action states the following:

... it would have been obvious to ... use both LiSiO and SiO as the active materials for the intercalating layer in Beard as taught by Yamada in order to provide a lithium ion battery that has **improved discharge characteristics that will prevent deterioration during discharging of the battery...** (bold text added by Applicant to indicate advantages)

However, Yamada does not teach that the advantages set forth in the bolded text come from LiSiO and/or SiO. In contrast, Yamada attributes these advantages to the use of particular materials in the positive electrode (for instance, see paragraphs [0013], [0014], [0090] and [0161]). However, LiSiO and/or SiO are used in the negative electrode. Accordingly, the Applicant has respectfully requested the motivation for making the proposed modification. In response to this request, the same motivation has been cited. Since the cited motivation is not a result of using LiSiO and SiO, the required motivation has not yet been provided.

Second Reason that Claim 19 is Patentable over the cited art.

As noted above, current law holds that an obviousness rejection is not properly supported unless the cited art teaches or suggests every element of the claims.

The cited art does not teach or suggest each of the claim limitations. Claim 19 recites, “an anode having a second medium (with) a chemical composition that is different from a chemical composition of the first medium, ...(where) the second medium including SiO and (a) second active material including LiSiO.” Accordingly, claim 19 recites an anode with a second medium with LiSiO and SiO and a different chemical composition than a first medium. This recitation is called “the limitation” below.

Yamada teaches a negative electrode having a layer of negative electrode active material on a negative electrode current collector. However, Yamada does not teach or suggest a second layer of negative electrode active material on the negative electrode and having a chemical composition that is different from the first layer of negative electrode active material. In the absence of this teaching, Yamada does not teach or suggest a second medium with LiSiO and SiO and a different chemical composition than a first medium.

Beard does not teach or suggest the limitation. For instance, Beard teaches a layer of an intercalation compound on lithium metal. However, Beard does not teach or suggest that the intercalation compound includes SiO and LiSiO.

Since neither Beard nor Yamada teaches or suggests the limitation individually, **we look at the combined teachings of Beard and Yamada.** The Office Action argues that “it would have been obvious to ... use both the LiSiO and SiO as the active materials for the intercalating layer in Beard. However, Beard teaches that suitable intercalation compounds include transition metals (Abstract). Since neither SiO nor LiSiO includes transition metals, neither Beard nor Yamada teaches or suggests using either SiO or LiSiO in Beard’s intercalation compound. Accordingly, even when considered in combination, the cited art fails to teach or suggest the limitation.

Additionally, teachings regarding SiO or LiSiO in Yamada are very scarce. In fact, the only teaching that the Applicant has been able to find in Yamada regarding the use of SiO or LiSiO in Yamada’s negative electrode is as follows:

Examples of these negative electrode active materials include SiC, Si₃N₄, Si₂N₂O, Ge₂N₂O, SiO_x, where $0 < x \leq 2$, SnO_x, where $0 < x \leq 2$, SnO_x, where $0 < x \leq 2$, LiSiO and LiSnO.

There is nothing about this teaching that even suggests substituting these compounds for Beard’s transition metal compounds. As a result, the combination of Beard and Yamada further fails to teach or suggest the limitation.

The above argument was made in the Amendment filed on December 10, 2008. In response, the Office Action states that the Applicant was not addressing the combination of references but was arguing the references separately. However, as noted by the text that is both underlined and bolded above, the above argument addresses the cited art in combination. In particular, the above argument directly compares Yamada’s teachings regarding SiO and LiSiO to Beard’s teachings regarding the intercalation layer. Since the Office Action does not respond to this argument, the Applicant cannot address arguments set forth in the Office Action at this time

Since Beard in view of Yamada does not teach or suggest every element of claim 19, claim 19 is patentable over the cited art.

CLAIMS 20-23, 25, 26, 29, 32, and 33

Since Claims 20-23, 25, 26, 29, 32, and 33 each depends directly or indirectly from claim 19 and since claim 19 is patentable over the combination of Beard and Yamada for the reasons

set forth above, Claims 20-23, 25, 26, 29, 32, and 33 are also patentable over the combination of Beard and Yamada.

6. Claims 27, 28, 30, and 31 stand rejected under 35 USC §103(a) as being unpatentable over Beard in view of Yamada and further in view of Munshi.

Since Claims 27, 28, 30, and 31 each depends directly or indirectly from claim 19 and since claim 19 is patentable over the cited art, claims 27, 28, 30, and 31 are also patentable over the cited art.

7. Claims 78 stands rejected under 35 USC §103(a) as being unpatentable over Beard in view of Yamada and further in view of Tamura.

Since Claim 78 depends directly or indirectly from claim 19 and since claim 19 is patentable over the cited art, claim 78 is also patentable over the cited art.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Travis Dodd', with a stylized flourish at the end.

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VIII. CLAIMS APPENDIX

1. (previously presented) A primary battery, comprising:

a cathode;

an anode having a first medium including a first active material and a second medium including a second active material,

the second medium having a chemical composition that is different from a chemical composition of the first medium,

the second medium having a non-zero concentration gradient of the second active material in the second medium,

the concentration gradient being present in the anode before initial discharge of the primary battery; and

an electrolytic solution in contact with the cathode and the anode.

2. (previously presented) The battery of claim 1, wherein the first medium is positioned so as to protect at least a portion of the second medium from the electrolytic solution, the first medium being configured to dissipate during discharge of the battery enough to expose one or more of the protected regions of the second medium to the electrolytic solution.

3. (previously presented) The battery of claim 1, wherein the first medium is positioned so as to protect at least a portion of the second medium from the electrolytic solution, the first medium being positioned such that the concentration of the second active material decreases in a direction moving away from the first medium.

4. (canceled)

5. (previously presented) The battery of claim 1, wherein a chemical composition of the first active material includes a component in common with a chemical composition of the second active material

6. (previously presented) The battery of claim 5, wherein an ion of the common component is

present in the electrolytic solution.

7. (previously presented) The battery of claim 5, wherein the cathode excludes the common component before discharge of the battery.

8. (previously presented) The battery of claim 5, wherein the first active material consists of the common component.

9. (previously presented) The battery of claim 8, wherein the common component is lithium.

10. (previously presented) The battery of claim 1, wherein the first active material and the second active material are selected such that the second active material can be generated by exposing the first active material and a second active material precursor to an electrolytic solution.

11. (previously presented) The battery of claim 1, wherein the first active material includes lithium and the second active material includes lithium, silicon, and oxygen.

12. (previously presented) The battery of claim 1, wherein the cathode includes one or more components selected from the group consisting of CF_x , MnO_2 , silver vanadium oxide (SVO), SOCl_2 and SO_2Cl_2 .

13. (previously presented) The battery of claim 1, wherein the cathode includes CF_x .

14. (previously presented) The battery of claim 1, wherein the electrolytic solution includes one or more components serving as a secondary reactant in a secondary reaction including as a reactant the secondary reactant and a product of one or more primary reactions, the one or more primary reactions occur at an electrode during discharge of the battery prior to the secondary reaction.

15. (previously presented) The battery of claim 14, wherein the electrolytic solution includes

one or more components selected from the group consisting of lithium bis(oxalato)borate, lithium cyclopentadiene, lithium tetramethylcyclopentadiene, vinyl sulfolane, and carbon disulfide.

16. (previously presented) The battery of claim 14, wherein the electrolytic solution includes lithium bis(oxalato)borate.

17. (previously presented) The battery of claim 14, wherein the anode, cathode and electrolytic solution are selected to produce a voltage discharge profile having a capacity approximation section with a slope in a range of -3.0%/ to -0.3%/ for a depth of discharge duration of at least 15%.

18. (previously presented) The battery of claim 14, wherein the anode, cathode and electrolytic solution are selected to produce a voltage discharge profile having a plateau before the capacity approximation section, the plateau having a slope in a range of -0.3%/ to 0.3%/ for a depth of discharge duration of at least 15%.

19. (previously presented) A primary battery, comprising:

a cathode;

an anode having a first medium including first active material and a second medium including a second active material,

the second medium having a chemical composition that is different from a chemical composition of the first medium,

a chemical composition of the first active material having a component in common with a chemical composition of the second active material,

the first active medium contacting the second active medium, the first active medium including lithium metal and the second medium including SiO and the second active material including LiSiO; and

an electrolytic solution in contact with the anode and the cathode.

20. (previously presented) The battery of claim 19, wherein the first active material is present in

an amount that would cause the first active material to be depleted if the first active material were the only active material in the anode.

21. (previously presented) The battery of claim 19, wherein an ion of the common component is present in the electrolytic solution.

22. (previously presented) The battery of claim 19, wherein the first active material and the second active material are selected such that the second active material can be generated by exposing the first active material and a second active material precursor to an electrolytic solution.

23. (previously presented) The battery of claim 19, wherein the first active material consists of the common component.

24. (canceled)

25. (previously presented) The battery of claim 19, wherein the first active material includes lithium and the second active material includes lithium, silicon, and oxygen.

26. (previously presented) The battery of claim 19, wherein the cathode excludes the common component before discharge of the battery.

27. (previously presented) The battery of claim 19, wherein the cathode includes one or more components selected from the group consisting of CF_x , MnO_2 , silver vanadium oxide (SVO), SOCl_2 , and SO_2Cl_2 .

28. (previously presented) The battery of claim 19, wherein the cathode includes CF_x .

29. (previously presented) The battery of claim 19, wherein the electrolytic solution includes one or more components serving as a secondary reactant in a secondary reaction including as a reactant the secondary reactant and a product of one or more primary reactions, the one or more

primary reactions occur at an electrode during discharge of the battery prior to the secondary reaction.

30. (previously presented) The battery of claim 29, wherein the electrolytic solution includes one or more components selected from the group consisting of lithium bis(oxalato)borate, lithium cyclopentadiene, lithium tetramethylcyclopentadiene, vinyl sulfolane, and carbon disulfide.

31. (previously presented) The battery of claim 29, wherein the electrolytic solution includes lithium bis(oxalato)borate.

32. (previously presented) The battery of claim 19, wherein the anode, cathode and electrolytic solution are selected to produce a voltage discharge profile having a capacity approximation section with a slope in a range of $-3.0\%/%$ to $-0.3\%/%$ for a depth of discharge duration of at least 15%.

33. (previously presented) The battery of claim 19, wherein the anode, cathode and electrolytic solution are selected to produce a voltage discharge profile having a plateau before the capacity approximation section, the plateau having a slope in a range of $-0.3\%/%$ to $0.3\%/%$ for a depth of discharge duration of at least 15%.

34-73. (canceled)

74. (previously presented) The battery of claim 11, wherein the second active material is LiSiO .

75. (previously presented) The battery of claim 74, wherein the second medium includes SiO .

76. (previously presented) The battery of claim 1, wherein the second medium includes a second active material precursor that can react with the first active material to form the second active material.

77. (previously presented) The battery of claim 1, wherein the second medium has a second non-zero concentration gradient of the second active material precursor in the second medium, the second non-zero gradient being present in the second medium before initial discharge of the primary battery.

78. (previously presented) The battery of claim 19, wherein the second medium has a first non-zero concentration gradient of the LiSiO in the second medium and has a second non-zero concentration gradient of the SiO in the second medium, the first non-zero concentration gradient and the second non-zero concentration gradient being present in the second medium before initial discharge of the primary battery.

IX. EVIDENCE APPENDIX

1. Text of *Wang Laboratories Inc. v. Toshiba Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993) – 5 pgs.
2. Westlaw “KEYCITE”® for *Wang Laboratories Inc. v. Toshiba Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993) – 10 pgs.

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993 F2d 858 Wang Laboratories Inc v. Toshiba Corporation

993 F.2d 858

26 U.S.P.Q.2d 1767

WANG LABORATORIES, INC., Plaintiff/Cross-Appellant,
v.
TOSHIBA CORPORATION; Toshiba America Electronic Components,
Inc.; Toshiba America Information Systems, Inc.,
Defendants-Appellants,
and
NEC Corporation; NEC Electronics Inc. and NEC Technologies,
Inc., Defendants-Appellants,
and
Molex Incorporated, Defendant.

Nos. 92-1006, 92-1008 and 92-1025.

United States Court of Appeals,
Federal Circuit.

May 10, 1993.

Rehearing Denied; Suggestion for Rehearing In Banc Declined
June 28, 1993.

Thomas J. Scott, Howrey & Simon, Washington, DC, argued, for plaintiff/cross-appellant. With him on the brief, were Robert F. Ruyak, Sheila R. Schreiber and Diane B. Heller. Also on the brief, were Edward A. Grayson, Michael H. Shanahan and Paul W. Sandman, Wang Laboratories, Inc., Lowell, MA.

Edward F. McKie, Banner, Birch, McKie & Beckett, Washington, DC, argued, for defendants-appellants, Toshiba Corp. With him on the brief, were Dale H. Hoscheit, Joseph M. Skerpon, Richard J. Moura and Pamela I. Banner. Howard L. Bernstein, Sughrue, Mion, Zinn, MacPeak & Seas, Washington, DC, argued, for defendants-appellants, NEC Corp. With him on the brief, were J. Frank Osha, L. Peter Bernstein and Brett S. Sylvester.

Before ARCHER, LOURIE, and CLEVENGER, Circuit Judges.

LOURIE, Circuit Judge.

This is a patent infringement suit involving two patents on memory modules. It comes to us as a consolidated appeal and cross-appeal from the August 23, 1991 judgment, 1991 WL 333696, and the October 23, 1991 amended judgment of the United States District Court for the Eastern District of Virginia, Civil No. 90-1477-A. On August 8, 1991, a jury returned a verdict in favor of Wang Laboratories, Inc., finding U.S. Patents 4,656,605 and 4,727,513 infringed by Toshiba Corporation, Toshiba America Electronic Components, Inc., and Toshiba America Information Systems, Inc. (collectively Toshiba) and NEC Corporation, NEC Electronics Inc., and NEC Technologies, Inc. (collectively NEC), and not invalid. The jury found that NEC had willfully infringed the patents in suit, while Toshiba's infringement was not willful. On August 14, 1991, the jury determined that Wang was entitled to a reasonable royalty as compensation for the infringement and determined alternative reasonable royalty rates. On August 23, 1991, the district court entered judgment in accordance with the jury verdicts, ruled that the patents were not invalid and were infringed, and awarded a reasonable royalty as damages.

Toshiba and NEC filed post-trial motions for judgment notwithstanding the verdict (JNOV),¹ which the district court subsequently denied.² Wang moved to amend the judgment as to damages; this motion was also denied. Toshiba and NEC now appeal from the district court's judgment denying JNOV on the issues of validity and infringement. Wang cross-appeals the district court's failure to amend the judgment as to the royalty rate. We affirm-in-part, reverse-in-part, and remand-in-part.

BACKGROUND

The '605 and '513 patents, both entitled "Single In-Line Memory Module," were issued in the name of James E. Clayton and assigned to Wang. The '605 patent issued on April 7, 1987, and the '513 patent on February 23, 1988 from a continuation of the application that led to the '605 patent.³

The patents relate to single in-line memory modules (SIMMs) having eight data memory chips capable of storing 8-bit binary words or bytes.⁴ Additionally, the memory modules include a ninth chip, which functions as a check or parity bit for error detection.⁵ The nine memory chips, which are packaged in plastic leaded chip carriers (PLCCs), are mounted on a single epoxy-glass printed circuit board substrate. Decoupling capacitors for suppressing voltage spikes are also mounted on the memory module substrate. Preferably, access terminals are arrayed across the bottom of the device for data input and output, data address and memory control, and device power. The '605 patent claims require that the ninth chip be interconnected with the other eight, while the '513 patent claims do not require this interconnection so that the parity chip can be written to or read from independently of the eight data chips.

The '605 patent contains one claim, which reads as follows:

A memory module for installation on a printed circuit motherboard comprising:

eight data memory chips for storing digital data, each having a data input and output, a control input, and an address input, and each being packaged in a plastic leaded chip carrier;

a ninth memory chip for storing error detection and correction information associated with the eight data memory chips, said ninth memory chip having a data input and output, a control input and an address input interconnected with those of the eight memory chips, and a control input to provide writing in or reading out of the ninth memory chip at times other than when said bytes of digital information are written into or read out of the eight data memory chips to thereby facilitate said error detection and correction operation;

an epoxy-glass printed circuit board substrate having a length and width adequate for mounting thereon only in a single row said nine memory chips and for interconnecting the control inputs and the address inputs of the memory chips so that bytes of digital information may be input to or output from the memory chips one at a time;

the substrate including thirty terminals for providing access to the data inputs and outputs, control inputs, and address inputs of the nine memory chips to enable reading and writing of bytes of digital information into and out of the eight memory chips and to enable reading and writing of error detection and correction information into and out of the eight memory chips;

support means for supporting the memory module at an angle with respect to the printed circuit motherboard when the memory module is installed thereon; and

eight decoupling capacitors, mounted on said substrate and connected between the nine memory chips, for suppressing transient voltage spikes between said memory chips.

(Emphasis added).

The '513 patent contains Claims 1 and 2, which read as follows: 1. A memory module for installation on a printed circuit motherboard comprising

nine data memory chips for storing digital data, each having a data input and output, control input, and an address input, and each being packaged in a plastic leaded chip carrier, wherein said ninth memory chip is for storing detection and correction information associated with the eight data memory chips,

an epoxy-glass printed circuit board substrate having a length and width adequate for mounting thereon only in a single row said nine memory chips and for interconnecting the control inputs and the address inputs of the memory chips so that bytes of digital information may be input to or output from the memory chips,

the substrate including thirty terminals for providing access to the data inputs and outputs, control inputs, and address inputs of the nine memory chips and to enable reading and writing of information into and out of the nine chips,

support means for supporting the memory module at an angle with respect to a motherboard and

decoupling capacitors mounted on said substrate and coupled to the memory chips for suppressing transient voltages.

2. The module of claim 1 wherein all nine memory chips are interconnected such that data is input to or output from the ninth memory chips when data is input to or output from the other eight memory chips.

(Emphasis added).

Toshiba and NEC manufacture several different types of memory modules, including (1) classic nine-chip modules, which have eight data chips and one error detection chip arranged in a single row on a printed circuit board substrate; (2) 3-pack modules, which have three chips arranged in a single row, two half-bytes, which read and store four bits of information each, and a parity chip; and (3) lateral modules, which have nine chips arranged in more than a single row. Of these modules, some are leaded, i.e., electrical leads extend from the module substrate and electrically connect the module to a printed circuit motherboard, and some are leadless, i.e., an edge of the module is designed to mate with a socket attached to a printed circuit motherboard. The jury found, inter alia, that the classic modules literally infringed claim 1 of the '513 patent and infringed claim 1 of the '605 patent and claim 2 of the '513 patent under the doctrine of equivalents; the 3-pack modules (all leadless) infringed claim 1 of both patents under the doctrine of equivalents; and the lateral modules infringed claim 1 of both patents under the doctrine of equivalents.⁶

The jury determined two reasonable royalty rates, one 4.0%, assuming hypothetical royalty negotiations to have occurred in April 1987, the date when the '605 patent issued, and the other 2.75%, assuming hypothetical royalty negotiations to have occurred in January 1990, the date Wang gave notice of infringement. The court adopted January 1990 as the date when hypothetical royalty negotiations occurred, making the royalty rate 2.75%. The parties stipulated to the amount of infringing sales, excluding sales covered by a licensing agreement between Wang and IBM, as being \$31,106,509 by NEC and \$88,121,819 by Toshiba. The court awarded double damages to Wang for NEC's willful infringement. Based on a 2.75% royalty rate, Wang was awarded

\$855,429 to be paid by NEC and \$2,423,350 to be paid by Toshiba, plus prejudgment interest of 8.0% per annum from October 1, 1990 to August 23, 1991, the date of entry of judgment, plus post-judgment interest at the statutory rate. The court also issued a permanent injunction against both Toshiba and NEC.⁷

Toshiba and NEC jointly moved for JNOV on the issues of best mode, written description, obviousness, and infringement, all of which were denied. NEC moved for JNOV on the issues of willfulness, which was denied, and enhanced damages, which was granted. Wang moved to amend the judgment as to the date of the hypothetical negotiations, to increase the enhanced damages, and for attorney fees, all of which were denied. Toshiba and NEC now appeal from the district court's judgment denying JNOV on the issues of obviousness, failure to meet the written description requirement, and infringement. Wang cross-appeals the court's failure to amend the judgment as to the reasonable royalty rate.

DISCUSSION

I. Standard of Review from Denial of JNOV on Infringement and Validity

On appeal of a judgment entered on a verdict after denial of a motion for JNOV, Toshiba and NEC must show

(1) that reasonable persons could not in light of [] evidence [before them] have found the facts necessary to support the jury's verdict; or (2) that the facts properly found cannot in law support that verdict.

Railroad Dynamics, Inc. v. A. Stucki Co., 727 F.2d 1506, 1513, 220 USPQ 929, 936 (Fed.Cir.), cert. denied, 469 U.S. 871, 105 S.Ct. 220, 83 L.Ed.2d 150 (1984). Fact findings reviewed under the substantial evidence standard require affirmance unless appellants show that no reasonable juror could have reached such a result. *Id.* In reviewing the evidence from a denial of JNOV, we must

(1) consider all the evidence, (2) in a light most favorable to the non-mover[,] (3) drawing reasonable inferences favorable to the non-mover[,] (4) without determining credibility of witnesses, and (5) without substituting [our] choice for that of the jury between conflicting elements in the evidence.

Dana Corp. v. IPC Ltd. Partnership, 860 F.2d 415, 417, 8 USPQ2d 1692, 1694-95 (Fed.Cir.1988) (citations omitted), cert. denied, 490 U.S. 1067, 109 S.Ct. 2068, 104 L.Ed.2d 633 (1989).

II. Obviousness

Toshiba and NEC argue that the claims in suit are invalid for obviousness under 35 U.S.C. § 103 (1988).⁸ Specifically, they state that the claimed subject matter would have been obvious in view of U.S. Patent 4,281,392 assigned to Allen-Bradley Company, sales of Allen-Bradley's X9 SIMMS, and Texas Instruments 1982 MOS Memory Data Book. The appellants further assert that the district court erroneously read limitations into the claims, viz., use of the memory modules in a "personal computer"; attributes of greater storage capacity and less cost for the memory modules compared with those in the prior art; and possession of exactly 30 terminals. While we agree that the claims do not contain these limitations, we do not find this to be determinative on the question of nonobviousness. There is substantial evidence that certain of the prior art was not analogous, and hence the validity of the claims can be upheld for that reason.

Nonobviousness is a legal conclusion, having factual underpinnings, including the scope and content of the prior art. *Graham v. John Deere Co.*, 383 U.S. 1, 17, 86 S.Ct. 684, 693, 15 L.Ed.2d 545, 148 USPQ 459, 467 (1966). "When the Graham factual underpinnings have been genuinely disputed, as in this case, we presume that the jury resolved them in favor of the verdict winner." *Jurgens v. McKasy*, 927 F.2d 1552, 1558, 18 USPQ2d 1031, 1036 (Fed.Cir.) (citing *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 893, 221 USPQ 669, 674 (Fed.Cir.), cert. denied, 469 U.S. 857, 105 S.Ct. 187, 83 L.Ed.2d 120 (1984)), cert. denied, --- U.S. ---, 112 S.Ct. 281, 116 L.Ed.2d 232 (1991); see also *Newell Cos. v. Kenney Mfg. Co.*, 864 F.2d 757, 765, 9 USPQ2d 1417, 1423 (Fed.Cir.1988) ("Judges must accept the factual findings, presumed from a favorable jury verdict, which are supported under the substantial evidence/reasonable juror standard."), cert. denied, 493 U.S. 814, 110 S.Ct. 62, 107 L.Ed.2d 30 (1989).

Appellants assert that Allen-Bradley's '392 patent and its commercial counterpart, the X9 SIMM, are analogous to the claimed subject matter, and accordingly that they are effective to render the claims in suit invalid. However, because of the adequate jury instruction concerning analogous art, we will presume that the Allen-Bradley art was found to be non-analogous to the claimed subject matter. The question then is whether that finding is supported by substantial evidence. We conclude that there was substantial evidence.

Analogous art is that which is relevant to a consideration of obviousness under section 103. See *In re Sovish*, 769 F.2d 738, 741, 226 USPQ 771, 773 (Fed.Cir.1985). "Whether something legally within the prior art is 'analogous' is a fact question...." *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568 n. 9, 1 USPQ2d 1593, 1597 n. 9 (Fed.Cir.), cert. denied, 481 U.S. 1052, 107 S.Ct. 2187, 95 L.Ed.2d 843 (1987). Two criteria are relevant in determining whether prior art is analogous: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the art is not within the same field of endeavor, whether it is still reasonably pertinent to the particular problem to be solved. *In re Clay*, 966 F.2d 656, 658-59, 23 USPQ2d 1058, 1060 (Fed.Cir.1992) (citations omitted).

The '392 patent is entitled "Memory Circuit for Programmable Machines"; it discloses a SIMM containing nine memory chips, eight for storing data and one for error detection, mounted in a single row. In the late 1970's, Allen-Bradley manufactured and sold the X9 SIMM for use in its 9-bit programmable controller. This product consisted of nine memory chips encapsulated in ceramic dual in-line packages (ceramic DIPs) mounted on an epoxy-glass printed circuit board substrate.

The Allen-Bradley art is not in the same field of endeavor as the claimed subject matter merely because it relates to memories. It involves memory circuits in which modules of varying sizes may be added or replaced; in contrast, the subject patents teach compact modular memories. Thus, based on the evidence of record, the jury could reasonably have found that the first criterion of the analogous art test has not been met and that the prior art and the claimed subject matter are not in the same field of endeavor.

Even though the Allen-Bradley art is not within the relevant field of endeavor, it may still be analogous if it is reasonably pertinent to the problem the inventor attempted to solve. *Id.* at 659, 23 USPQ2d at 1060-61 (citation omitted). "A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an

inventor's attention in considering his problem." *Id.* at 659, 23 USPQ2d at 1061. However, given the jury's ultimate conclusion, we presume that the jury decided that the Allen-Bradley art was not reasonably pertinent. The question then is whether that conclusion is supported by substantial evidence.

Dr. Jeffrey Frey, Wang's technical expert, testified that the Allen-Bradley technology, including the SIMM described in the patent and the X9, was not pertinent to the field of personal computers for which Wang's SIMMs were designed. Although Wang's patents do not mention the term "personal computer," Dr. Frey stated that "[t]he entire context of the patent[s]--in the application of the memories, units of nine, dynamic memories--indicates they're meant for use in personal computers." Dr. Frey further testified that the Allen-Bradley module was developed for use in a controller of large industrial machinery and could not be used in a personal computer. He also stated that the Allen-Bradley patent teaches the use of Static Random-Access-Memories (SRAMs) or Read-Only-Memories (ROMs) and does not suggest the use of Dynamic Random-Access-Memories (DRAMs) as taught by Wang. As Dr. Frey stated, DRAMs are primarily used in personal computers (PCs), while SRAMs, which are larger and more expensive, are not used in PCs.

Wang's SIMMs were designed to provide compact computer memory with minimum size, low cost, easy repairability, and easy expandability. See '605 patent, col. 2, lines 61-64 ("By using the small D-RAMs and small capacitors, module 30 may have physical dimensions [on] the order of three-quarter inch by three inches while providing large memory capacity."). In contrast, the Allen-Bradley patent relates to a memory circuit for a larger, more costly industrial controller. SRAMs were used by Allen-Bradley because of their intended industrial environment. According to Dr. Frey, size was not a consideration in the Allen-Bradley work. Thus, there is substantial evidence in the record to support a finding that the Allen-Bradley prior art is not reasonably pertinent and is not analogous.

Toshiba and NEC also argue that Wang stipulated that the Allen-Bradley art is analogous. We disagree. At trial, the parties stipulated that the Texas Instruments 1982 MOS Memory Data Book, the '392 patent, and Allen-Bradley's X9 SIMM were prior art to the '605 and '513 patents, but were not before the examiner during prosecution. When the court asked if "[t]hese are the stipulated prior art references[?]," and referred to the Allen-Bradley patent and X9 SIMM among other art, Wang did not stipulate that this art was analogous. Wang acknowledged only that it was prior art, not analogous prior art.

The Allen-Bradley patent and X9 SIMM, not being analogous prior art, thus could not have rendered the claimed subject matter obvious. See *Jurgens*, 927 F.2d at 1559, 18 USPQ2d at 1036. Since Toshiba and NEC rely principally on the Allen-Bradley art and only point to the Texas Instruments reference in combination with Allen-Bradley, appellants have failed to show that the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time Wang's inventions were made.⁹

III. Written Description

NEC¹⁰ argues that the '605 and '513 patents are invalid for failure to comply with the written description requirement of 35 U.S.C. § 112, first paragraph, which states that

[t]he specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art ...

35 U.S.C. § 112 (1988) (emphasis added). The standard for determining whether the written description requirement has been met has been stated as follows:

Although [the applicant] does not have to describe exactly the subject matter claimed, ... the description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed.... The test for sufficiency of support in a parent application is whether the disclosure of the application relied upon reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter.

Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555, 1563, 19 USPQ2d 1111, 1116 (Fed.Cir.1991) (citations and quotations omitted). Whether the written description requirement has been met is a question of fact. *Ralston Purina Co. v. Far-Mar-Co. Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed.Cir.1985). Thus, we must determine whether substantial evidence supports the verdict that the written description requirement was met.

According to NEC, the recitation of "support means for supporting the memory module at an angle with respect to the printed circuit motherboard" was not supported by the original Clayton application, and therefore the claims in both patents are invalid. NEC notes that "support means" was not recited in the original claims, but was added by amendment. It alleges that the specification describes the leads of the memory modules as having only an electrical function, not a mechanical, support function.

A patent specification is directed to one of ordinary skill in the art. In *re Hayes Microcomputer Prods., Inc. Patent Litigation*, 982 F.2d 1527, 1533, 25 USPQ2d 1241, 1245 (Fed.Cir.1992). It is also clear that "drawings alone may provide a 'written description' of an invention as required by § 112." *Vas-Cath*, 935 F.2d at 1565, 19 USPQ2d at 1118. Dr. Frey testified that Figure 2 "show[s] terminals as leads, which are means of supporting the module." Additionally, Dr. Frey stated, when discussing whether leadless SIMMs are disclosed in the patents, that a person of ordinary skill in the art would know that a leadless SIMM includes a row of terminals "to mount and support that module." He went on to state that "it's the edge of the card and the terminals that support the module." The inventor, Mr. Clayton, also testified that on leaded SIMMs, the leads themselves are the support means, and that on leadless SIMMs, the bottom row of terminals constitutes the support means. Thus, there is substantial evidence in the record to support the conclusion that the support means element is adequately described in the specification by the disclosure of both leads and the terminal edge of the modules. NEC has not shown that the district court's denial of JNOV on the issue of failure to meet the written description requirement was incorrect.

IV. Infringement

A. Lateral and 3-Pack Memory Modules

Toshiba and NEC both appeal that part of the judgment finding infringement under the doctrine of equivalents by the sale of their lateral and 3-pack memory modules. Toshiba argues that prosecution history estoppel bars application of the doctrine. Specifically, Toshiba argues that the 3-pack modules have three memory chips rather than nine, and the lateral modules do not have memory chips mounted only in a single row. They assert that both of these claim limitations were added to overcome rejections based on prior art. Accordingly, Toshiba argues, Wang is now estopped from claim scope given up during prosecution.

Although Toshiba asserts that prosecution history estoppel applies to both its lateral and its 3-pack memory modules, NEC only raises estoppel with respect to its 3-pack modules and argues that its lateral modules do not infringe Wang's claims because they are leadless. Normally an issue not raised by an appellant in its initial brief is waived. However, "[t]his practice is ... not governed by a rigid rule but may as a matter of discretion not be adhered to where circumstances indicate that it would result in basically unfair procedure." *Becton Dickinson & Co. v. C.R. Bard, Inc.*, 922 F.2d 792, 800, 17 USPQ2d 1097, 1103 (Fed.Cir.1990). In this case, we can hardly give one appellant the benefit of an estoppel without giving it to the other, so we consider the defense of prosecution history estoppel as applicable to both Toshiba and NEC for both the 3-pack and lateral modules. Wang is not prejudiced by this because it was afforded the opportunity at trial and on appeal to address the issue with respect to the lateral modules. See *Singleton v. Wulff*, 428 U.S. 106, 120, 96 S.Ct. 2868, 2877, 49 L.Ed.2d 826 (1976). Moreover, in this case both parties relied on an estoppel defense at trial.

Prosecution history estoppel bars "a patentee from enforcing its claims against otherwise legally equivalent structures if those structures were excluded by claim limitations added in order to avoid prior art." *Mannesmann Demag Corp. v. Engineered Metal Prods. Co.*, 793 F.2d 1279, 1284, 230 USPQ 45, 48 (Fed.Cir.1986) (citations omitted). "In determining whether prosecution history estoppel applies because of a change in claim language during prosecution, the court must consider not only what was changed, but the reason for such change." *Vaupel Textilmaschinen KG v. Meccanica Euro Italia S.P.A.*, 944 F.2d 870, 882, 20 USPQ2d 1045, 1054 (Fed.Cir.1991) (citing *Sun Studs, Inc. v. ATA Equip. Leasing, Inc.*, 872 F.2d 978, 987, 10 USPQ2d 1338, 1345 (Fed.Cir.1989)). Whether estoppel applies is a question of law. *LaBounty Mfg., Inc. v. United States Int'l Trade Comm'n*, 867 F.2d 1572, 1576, 9 USPQ2d 1995, 1998 (Fed.Cir.1989).

Toshiba asserts that Wang specifically limited the scope of its claims to nine memory chips contained in a single row in order to overcome prior art and that Wang is precluded from recapturing what it gave up during prosecution. "Unmistakable assertions made by the applicant to the Patent and Trademark Office (PTO) in support of patentability, whether or not required to secure allowance of the claim, also may operate to preclude the patentee from asserting equivalency...." *Texas Instruments Inc. v. United States Int'l Trade Comm'n*, 988 F.2d 1165, 1174, 26 USPQ2d 1018, 1025 (Fed.Cir.1993) (citations omitted). "Depending on the nature and purpose of an amendment, it may have a limiting effect within a spectrum ranging from great to small to zero." *Hughes Aircraft Co. v. United States*, 717 F.2d 1351, 1363, 219 USPQ 473, 481 (Fed.Cir.1983). The prosecution history must be examined as a whole in determining whether estoppel applies. *Texas Instruments*, 988 F.2d at 1174, 26 USPQ2d at 1025.

In the first Office Action in Wang's parent application,¹¹ the claims were rejected under 35 U.S.C. § 103 as unpatentable over U.S. Patent 3,972,033 to Cislighi, who teaches a memory module with multiple rows of nine chips. In Cislighi the check bit, the ninth chip, is located on a separate module from the other eight bits. In response to the rejection, Wang replaced the filed claims so that they recited a printed circuit board substrate for mounting a plurality of memory chips in a single row. Wang stated:

The concept of applicant's invention lies in an improved memory module for installation on a printed circuit memory board. A single row of RAM memory chips, packaged in the plastic leaded chip carriers, is mounted on a printed circuit board (glass-epoxy) substrate....

Cislighi et al. discloses a memory consisting of two "submodule" printed circuit cards wherein check bits for the first card are contained on the second card and vice versa. Applicant's invention as presently claimed has little in common with the disclosure of Cislighi.... Cislighi [does not] have memory chips mounted in a single row....

(Emphasis added).

Thus, Wang added claims which recited "mounting said plurality of memory chips thereon in a single row." (Emphasis added). The limitation of mounting chips "in a single row" was a basis for overcoming the Examiner's rejection based on Cislighi. Unlike the teaching of Cislighi, Wang asserted that its invention accommodated the size constraints of its memory module, noting "[t]he purpose of applicant's invention is to conserve space on a memory board." The "single row" limitation was clearly made for the purpose of overcoming the prior art.

After a second Office Action, Wang filed a preliminary amendment in a file wrapper continuation application in which it cancelled its previous claims and added a new claim, reciting "an epoxy-glass printed circuit board substrate having a length and width adequate for mounting thereon only in a single row said nine memory chips." (Emphasis added). In the "Remarks" section accompanying the preliminary amendment, Wang stated that "Cislighi et al. teaches the advantage of locating a parity chip on a different printed circuit board...." Once again, these limitations were added to overcome the Examiner's rejection based on Cislighi.

Wang argues that the prosecution history does not exclude a substrate having memory chips mounted in two rows, but that the prior art only restricts the size of the substrate to one no larger than that on which nine DRAMs can be mounted. While a two-row construction may not read on the prior art, Wang limited the scope of its claims to memory chips mounted "only in a single row," and twice argued before the PTO that Cislighi did not have memory chips mounted in a single row. Although Cislighi taught the advantage of locating a parity chip on a separate module, Wang did not limit its claims to a single module. Instead, it chose a single row, which excludes the accused modules of Toshiba and NEC. Wang chose to emphasize the specific dimensions of the printed circuit board taught by the invention and limited itself to exclude any embodiment in which the memory chips are not physically located in a single row. See *Litton Sys., Inc. v. Whirlpool Corp.*, 728 F.2d 1423, 1439, 221 US

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KEYCITE

1 Wang Laboratories, Inc. v. Toshiba Corp., 993 F.2d 858, 26 U.S.P.Q.2d 1767 (Fed.Cir.(Va.), May 10, 1993) (NO. 92-1006, 92-1008, 92-1025)

History

Direct History

1 SINGLE IN-LINE MEMORY MODULE, US PAT 4656605, 1987 WL 550016 (U.S. PTO Utility Apr 07, 1987) (NO. 873879)

Ruled Infringed by

H 2 Wang Laboratories, Inc. v. Toshiba Corp., 1991 WL 333700 (E.D.Va. Oct 04, 1991) (NO. CIV. A. 90-1477A)

AND Ruled Valid and Infringed by

=> 3 Wang Laboratories, Inc. v. Toshiba Corp., 993 F.2d 858, 26 U.S.P.Q.2d 1767 (Fed.Cir.(Va.) May 10, 1993) (NO. 92-1006, 92-1008, 92-1025), rehearing denied, in banc suggestion declined (Jun 28, 1993) (BNA Version)

AND Ruled Not Infringed by

H 4 Wang Laboratories, Inc. v. Mitsubishi Electronics America, Inc., 1994 WL 782694, 32 U.S.P.Q.2d 1641 (C.D.Cal. May 09, 1994) (NO. CV 92-3891 JGD, CV 92-4698 JGD) (BNA Version)

Affirmed by

1 5 Wang Laboratories, Inc. v. Mitsubishi Electronics America, Inc., 103 F.3d 1571, 41 U.S.P.Q.2d 1263 (Fed.Cir.(Cal.) Jan 03, 1997) (NO. 95-1276, 95-1324), rehearing denied, in banc suggestion declined (Mar 12, 1997) (BNA Version)

Certiorari Denied by

H 6 Wang Laboratories, Inc. v. Mitsubishi Electronics America, Inc., 522 U.S. 818, 118 S.Ct. 69, 139 L.Ed.2d 30, 65 USLW 3827, 66 USLW 3245, 66 USLW 3255 (U.S. Oct 06, 1997) (NO. 96-1960)

1 7 SINGLE IN-LINE MEMORY MODULE, US PAT 4656605, 1987 WL 550016 (U.S. PTO Utility Apr 07, 1987) (NO. 873879)

Ruled Valid and Not Infringed by

1 8 Wang Laboratories, Inc. v. Mitsubishi Electronics America, Inc., 103 F.3d 1571, 41 U.S.P.Q.2d 1263 (Fed.Cir.(Cal.) Jan 03, 1997) (NO. 95-1276, 95-1324), rehearing denied, in banc suggestion declined (Mar 12, 1997) (BNA Version)

Certiorari Denied by

H 9 Wang Laboratories, Inc. v. Mitsubishi Electronics America, Inc., 522 U.S. 818, 118 S.Ct. 69, 139 L.Ed.2d 30, 65 USLW 3827, 66 USLW 3245, 66 USLW 3255 (U.S. Oct 06, 1997) (NO. 96-1960)

V 10 SINGLE IN-LINE MEMORY MODULE, US PAT 4656605, 1987 WL 550016 (U.S. PTO Utility Apr 07, 1987) (NO. 873879)

Construed by

H 11 Wang Laboratories, Inc. v. Oki Electric Industry Co., Ltd., 15 F.Supp.2d 166, 1998 Markman 452637 (D.Mass. Jul 31, 1998) (NO. CIV.A. 93-11882-RCL)

V 12 SIGNAL IN-LINE MEMORY MODULE, US PAT 4727513, 1988 WL 809289 (U.S. PTO Utility Feb 23, 1988) (NO. 16704)

Ruled Infringed by

H 13 Wang Laboratories, Inc. v. Toshiba Corp., 1991 WL 333700 (E.D.Va. Oct 04, 1991) (NO. CIV. A. 90-1477A)

AND Ruled Valid and Infringed by

=> 14 Wang Laboratories, Inc. v. Toshiba Corp., 993 F.2d 858, 26 U.S.P.Q.2d 1767 (Fed.Cir.(Va.) May 10, 1993) (NO. 92-1006, 92-1008, 92-1025), rehearing denied, in banc suggestion declined (Jun 28, 1993) (BNA Version)

AND Ruled Valid and Not Infringed by

V 15 Wang Laboratories, Inc. v. Mitsubishi Electronics America, Inc., 103 F.3d 1571, 41 U.S.P.Q.2d 1263 (Fed.Cir.(Cal.) Jan 03, 1997) (NO. 95-1276, 95-1324), rehearing denied, in banc suggestion declined (Mar 12, 1997) (BNA Version)

Certiorari Denied by

H 16 Wang Laboratories, Inc. v. Mitsubishi Electronics America, Inc., 522 U.S. 818, 118 S.Ct. 69, 139 L.Ed.2d 30, 65 USLW 3827, 66 USLW 3245, 66 USLW 3255 (U.S. Oct 06, 1997) (NO. 96-1960)

V 17 SIGNAL IN-LINE MEMORY MODULE, US PAT 4727513, 1988 WL 809289 (U.S. PTO Utility Feb 23, 1988) (NO. 16704)

Construed by

H 18 Wang Laboratories, Inc. v. Oki Electric Industry Co., Ltd., 15 F.Supp.2d 166, 1998 Markman 452637 (D.Mass. Jul 31, 1998) (NO. CIV.A. 93-11882-RCL)

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19 CONNECTING APPARATUS FOR ELECTRICALLY CONNECTING MEMORY MODULES TO A PRINTED CIRCUIT BOARD, US PAT 4850892, 1989 WL 789568 (U.S. PTO Utility Jul 25, 1989) (NO. 150009)

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21 Wang Laboratories, Inc. v. Toshiba Corp., 993 F.2d 858, 26 U.S.P.Q.2d 1767 (Fed.Cir.(Va.) May 10, 1993) (NO. 92-1006, 92-1008, 92-1025), rehearing denied, in banc suggestion declined (Jun 28, 1993) (BNA Version)

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23 Wang Laboratories, Inc. v. Toshiba Corp., 993 F.2d 858, 26 U.S.P.Q.2d 1767 (Fed.Cir.(Va.) May 10, 1993) (NO. 92-1006, 92-1008, 92-1025), rehearing denied, in banc suggestion declined (Jun 28, 1993) (BNA Version)

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24 Wang Laboratories, Inc. v. Mitsubishi Electronics America, Inc., 1995 WL 491434 (C.D.Cal. Mar 07, 1995) (NO. CV 92-3891 JGD, CV 92-4698 JGD)

Affirmed by

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25 Wang Laboratories, Inc. v. Mitsubishi Electronics America, Inc., 103 F.3d 1571, 41 U.S.P.Q.2d 1263 (Fed.Cir.(Cal.) Jan 03, 1997) (NO. 95-1276, 95-1324), rehearing denied, in banc suggestion declined (Mar 12, 1997) (BNA Version)

Certiorari Denied by

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26 Wang Laboratories, Inc. v. Mitsubishi Electronics America, Inc., 522 U.S. 818, 118 S.Ct. 69, 139 L.Ed.2d 30, 65 USLW 3827, 66 USLW 3245, 66 USLW 3255 (U.S. Oct 06, 1997) (NO. 96-1960)

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X. RELATED PROCEEDINGS APPENDIX

None.